WHAT IS CLAIMED IS:

1. A process for the preparation of monodisperse luminescent semiconductor nanocrystals having detectable properties within a target range, said method comprising:

(a) combining nanocrystal-forming reactants with a solvent to form a solution;

(b) continuously passing said solution at a selected flow rate through a thermally conductive reaction tube that is maintained at a temperature sufficiently high to initiate a reaction among said reactants, thereby producing a product mixture containing nanocrystals;

(c) monitoring said product mixture to detect properties of said nanocrystals that are indicative of the degree to which said nanocrystals possess desired characteristics; and

(d) comparing the value of said properties thus detected with said target range and adjusting either the temperature of said reaction tube, the flow rate of said solution, or both, if needed to correct any deviation between said value of said detected properties and said target range.

2. A process in accordance with claim **1** in which said properties thus detected are optical properties.

3. A process in accordance with claim **1** further comprising cooling said product mixture between steps (b) and (c) to a temperature sufficiently low to quench said reaction.

4. A process in accordance with claim **3** in which said cooling is achieved by a heat transfer medium in contact with said reaction tube.

5. A process in accordance with claim **1** in which step (c) is performed upon emergence of said product mixture from said reaction tube.

6. A process in accordance with claim **3** in which said cooling is performed by combining additional solvent with said product mixture, said additional solvent being at a temperature and a proportion relative to said product mixture sufficient to achieve a final temperature sufficiently low to quench said reaction.

7. A process in accordance with claim **2** in which said optical features are photoluminescent emission spectra, and step (c) comprises irradiating said product mixture with light and detecting wavelength spectra of photoluminescent energy emitted from said nanocrystals.

8. A process in accordance with claim **2** in which said optical features are absorbance, and step (c) comprises irradiating said product mixture with light and detecting absorbance spectra of said nanocrystals.

9. A process in accordance with claim **2** in which said optical features are light scattering, and step (c) comprises irradiating said product mixture with light and detecting the presence of light scattering by said nanocrystals.

10. A process in accordance with claim **1** further comprising contacting said solution with an oxygen-containing gas prior to step (b) under conditions sufficient to result in an increase in the rate or yield of said reaction.

11. A process in accordance with claim **1** in which said thermally conductive reaction tube is a coiled tube cast in a solid block of heat conductive metal.

12. A process in accordance with claim **1** in which temperature maintenance of said reaction tube is achieved by a heat transfer medium maintained at a temperature of at least about 100°C.

13. A process in accordance with claim **12** in which said heat transfer medium is maintained at a temperature of from about 100°C to about 400°C.

14. A process in accordance with claim **1** in which said nanocrystal-forming reactants are (i) a member selected from the group consisting of cadmium salts, zinc salts, cadmium oxide, zinc oxide, organocadmium compounds, and organozinc compounds, and (ii) a member selected from the group consisting of an elemental chalcogen and a chalcogen-containing compound.

15. A process in accordance with claim **14** in which said reactant (i) is a member selected from the group consisting of dimethyl cadmium and cadmium acetate.

16. A process in accordance with claim **14** in which said chalcogen is a member selected from the group consisting of sulfur, selenium, and tellurium.

17. A process in accordance with claim **14** in which said chalcogen is selenium.

18. A process in accordance with claim **1** in which said nanocrystal comprises a member selected from the group consisting of ZnS, ZnSe, ZnTe, CdS, CdSe, and CdTe.

19. A process in accordance with claim **1** in which said solvent is a member selected from the group consisting of alkyl phosphines, alkyl phosphine oxides, pyridines, furans, ethers, amines, and alcohols.

20. A process in accordance with claim **1** in which said solvent is a member selected from the group consisting of tri-n-octylphosphine and tri-n-octylphosphine oxide.

21. A process in accordance with claim **1** in which said solvent is a mixture of tri-n-octylphosphine and tri-n-octylphosphine oxide.

22. A process in accordance with claim **12** in which step (d) comprises adjusting the temperature of said heat transfer medium.

23. A process in accordance with claim **1** in which step (d) comprises adjusting the flow rate of said solution.

24. A process for the coating of nanocrystals with a passivating coating to achieve coated nanocrystals having detectable properties within a target range, said method comprising:

(a) combining nanocrystal cores with surface passivating reactants and a solvent to form a dispersion;

(b) continuously passing said dispersion through a thermally conductive reaction tube maintained at a temperature sufficiently high to initiate a reaction among said passivating reactants, thereby producing a product mixture containing nanocrystals coated with a passivating coating;

(c) monitoring said product mixture to detect properties of said nanocrystals that are indicative of the degree to which said nanocrystals possess desired characteristics; and

(d) comparing values of said properties thus detected with said target range and adjusting the temperature of said reaction tube, the flow rate of said solution, or both, if needed to correct any deviation between said values of said detected properties and said target range.

25. A process in accordance with claim **24** in which said surface passivating reactants are a Zn-containing reactant and a reactant containing a member selected from the group consisting of S, Se and Te, and said passivating coating is a coating of ZnY in which Y is a member selected from the group consisting of S, Se, and mixtures of S and Se.

26. A process in accordance with claim **24** in which step (c) is performed upon emergence of said product mixture from said reaction tube.

27. A process in accordance with claim **25** in which said surface passivating reactants are a dialkyl zinc and hexamethyldisilathiane.

28. A process in accordance with claim **24** further comprising cooling said product mixture between steps (b) and (c) to a temperature sufficiently low to quench said reaction.

29. A process in accordance with claim **28** in which said cooling is achieved by a heat transfer medium in contact with said reaction tube.

30. A process in accordance with claim **24** in which said properties are optical features.

31. A process in accordance with claim **30** in which said optical features are photoluminescent emission spectra, and step (c) comprises irradiating said product mixture with light and detecting wavelength spectra of photoluminescent energy emitted from said nanocrystals.

32. A process in accordance with claim **30** in which said optical features are absorbance, and step (c) comprises irradiating said product mixture with light and detecting absorbance spectra of said nanocrystals.

33. A process in accordance with claim **30** in which said optical features are light scattering, and step (c) comprises irradiating said product mixture with light and detecting the presence of light scattering by said nanocrystals.

34. A process in accordance with claim **24** further comprising contacting said dispersion with an oxygen-containing gas prior to step (b) under conditions sufficient to result in an increase in the rate of said reaction.

35. A process in accordance with claim **24** in which temperature maintenance of said reaction tube is achieved by a heat transfer medium maintained at a temperature of from about 100°C to about 400°C.

36. A process in accordance with claim **24** in which said solvent is a member selected from the group consisting of alkyl phosphines, alkyl phosphine oxides, pyridines, furans, ethers, amines, and alcohols.

37. A process in accordance with claim **24** in which said solvent is a member selected from the group consisting of tri-n-octylphosphine and tri-n-octylphosphine oxide.

38. A process in accordance with claim **24** in which said coordinating solvent is a mixture of tri-n-octylphosphine and tri-n-octylphosphine oxide.

39. A process in accordance with claim **35** in which step (d) comprises adjusting the temperature of said heat transfer medium.

40. A process in accordance with claim **24** in which step (d) comprises adjusting the flow rate of said solution.

41. Apparatus for the fabrication of monodisperse luminescent semiconductor nanocrystals having detectable properties within a target range, said apparatus comprising:

a thermally conductive reaction tube embedded in a heat transfer medium;

heating means for maintaining said heat transfer medium at a temperature sufficiently high to initiate a nanocrystal-forming reaction between nanocrystal-forming reactants passing therethrough;

pump means for continuously passing a fluid carrier bearing nanocrystal-forming reactants through said thermally conductive reaction tube at a reaction flow rate;

monitor means for monitoring a product stream borne by said fluid carrier to detect properties of any nanocrystals formed therein that are indicative of the degree to which said nanocrystals possess desired characteristics; and

control means for comparing values of said properties thus detected with said target range and adjusting the temperature of said heat transfer medium, the pump rate of said pump means, or both, if needed to correct any deviation between said values of said detected optical features and said target range.

42. Apparatus in accordance with claim **41** in which said properties are optical features.

43. Apparatus in accordance with claim **42** in which said optical features are photoluminescent emission spectra, and said monitor means comprise means for irradiating said product mixture with light and detecting wavelength spectra of photoluminescent energy emitted from said nanocrystals.

44. Apparatus in accordance with claim **42** in which said optical features are absorbance, and said monitor means comprise means for irradiating said product mixture with light and detecting absorbance spectra of said nanocrystals.

45. Apparatus in accordance with claim **42** in which said optical features are light scattering, and said monitor means comprise means for irradiating said product mixture with light and detecting the presence of light scattering by said nanocrystals.

46. Apparatus in accordance with claim **41** further comprising cooling means for cooling said product mixture borne by said fluid carrier upstream of said monitor means.

47. Apparatus in accordance with claim **41** in which said monitor means monitors said product stream as it emerges from said thermally conductive reaction tube.

48. Apparatus in accordance with claim **41** in which said control means adjusts the temperature of said heat transfer medium.

49. Apparatus in accordance with claim **41** in which said control means adjusts the pump rate of said pump means.